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TYPE INCIDENCE OF PNEUMOCOCCAL INFECTIONS IN OKLAHOMA*

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This paper and the accompanying exhibit is presented in an effort to show particularly the value of the work which Medical Technologists as a group may do to advance medical knowledge concerning laboratory procedures and assist in public health problems.

This work was done under the direction of Dr. H. D. Moor, Professor of Bacteriology and the facilities of the medical school used with the permission of Dr. Robert U. Patterson, dean of the medical school and superintendent of the University Hospital of the University of Oklahoma School of Medicine.

During the past few years the Bacteriology Department has been working on the problem of infections of the urinary tract caused by the Diplococcus pneumoniae. In a series of 329 cases of urinary tract infections we found 96 cases proven morphologically, culturally and serologically to be Diplococcus pneumoniae (23). Cultures from 27 of these cases agglutinated with Type XIV anti-pneumococcic serum. After this paper was published we received inquiries from many sources and from different sections of the United States asking us if Type XIV was prevalent in the state or just why we should get such a high incidence of this particular type in urinary tract infections. This led us to make an investigation by reviewing the literature and interviewing various persons in an effort to deter-

* *Read before the American Society of Medical Technologists, San Francisco, Calif., June, 1938.*

mine just what types of pneumococci were most prevalent in this section. We found no statistics available for Oklahoma or indeed for any of the midwestern states.

Since sera for typing all thirty-two types of pneumococci has only been generally available for a relatively short time and since many hospitals and smaller laboratories do not have all typing sera available nor the time to carry out typings in the higher groups and those types for which no serum is available, we decided to make a survey of the entire state. We realized that in order to do this we would have to have the cooperation of every person in the state who was doing typing. We knew that since most of the typing for pneumococci being done was carried out by registered technologists we adopted the following methods for the survey:

1. Through our state organization of Medical Technologists we contacted all of the registered technologists in the state asking them to send us records of all typings they had done during 1937. We also asked them to state the method they were using and requested them to send us any specimens of sputum which did not fall into the groups represented by the typing sera they kept on hand.

2. We sent a form letter to the superintendent of each registered hospital in the state and to the director of each medical diagnostic laboratory explaining our purpose and asking their cooperation and permission to use their records. If typing was not done in that hospital or if they had no typing facilities near we asked them to send us specimens of sputum in order that typing could be done. We made it clear in such instances that we were not doing such work as a diagnostic service.

3. We inserted an announcement in the county and state medical journals concerning the work we were attempting to do in order to reach those doctors who had no laboratory facilities available. Also in order to stimulate interest in the project we published progress reports from time to time in the state and county bulletins.

The late Georgia Cooper once said, (12), "The difference in the incidence of cases and the relative severity of the infection caused by the different types of pneumococci indicates that all types are not of equal importance, and it is questionable whether it is practical to attempt to produce therapeutic antisera for those that are less prevalent and less virulent. Although there is no immediate benefit to individual patients in determining the type where there is no therapeutic sera available, it seems worthwhile to continue examination for all the types and maintain a full supply of diagnostic antisera until it is learned whether there is a seasonal and periodical variation in the type in this locality and what their distribution in other localities is." Griffith (6) working with pneumonia cases in

the Southwick district in England found that there was a seasonal variation in types. In 1920 to 1928 he found a 32.6% incidence of Type II cases and only 7.4% in 1924-27. The incidence of Type I, however, was approximately the same in each period. At the time Griffith did his work there was no typing sera available for Types IV to XXXII. He lists all types not falling into I, II, and III as Group IV, so no knowledge of the seasonal variation of the higher types can be gained from his work.

Not only might there be a seasonal variation in the prevalence of types, but different investigators report that some of the types found most frequently in adults were seldom found in children and vice versa. Cooper, Rosenstein and others (12) report that the theory that children become infected with the types which are most widespread in normal throats is not supported by the facts observed since children are frequently affected by types that are rarely found in normal throats.

Due to the above facts we felt that this project would be of value; therefore we conducted our investigation with the following motives in mind:

1. To make an intensive study of the Neufeld method of rapid typing relative to the difficulties encountered in using this method, the sources of error, modifications, etc.

2. To determine the type incidence of pneumococcal infections in Oklahoma.

3. To stimulate interest among the state physicians in having typing done in the laboratories and hospitals equipped for this work that are available in their locality.

4. To render all possible assistance to the physicians and health authorities in the state in their efforts to reduce the death rate due to pneumonia which for the past ten years has ranked second among the causes of death in our state.

Before beginning our work we reviewed all the methods of typing that have been used since the time that Neufeld published his work in 1902 (1), (2), (3), (4), (5), (7), (8), (9), (10), (11), (13), (14), (15), (16), (18), (19), (20), (24) and (25). Many methods such as agglutination, precipitation, and various modifications of the Neufeld method are described. Agglutination tests were used for practically all of our typing on pneumococci found in the urinary tract since most of these cultures had lost their capsules. We used the Neufeld method exclusively for this survey. All of the late authorities agree that the Neufeld method as modified by Sabin (14) is the most rapid and satisfactory and those that have made comparisons with other methods of typing agree that it is fully as accurate. In the hands of experienced workers it has proven extremely suc-

cessful. We were able in every instance in our series of cases in which the case was proved to be pneumococcal in origin to type the organism by this method. We tried several methods and found that the modification reported by W. H. Roehll (24) to be the most satisfactory for our purpose. Since this was the method used in most cases I shall describe it in detail.

Preparations were made by using one very small loop to pick up the specimen being examined and one large loop approximately four times the diameter of the specimen loop to add the antiserum. The specimen and serum were then thoroughly mixed and smeared over approximately one-third of the slide. The slides were then allowed to dry for thirty minutes either in the incubator or in a cabinet out of the dust. They were then stained for one minute with Loeffler's Methylene blue, dried and examined with the oil immersion lens. No cover slips are required unless one wishes to make permanent mounts. This method has a great advantage over the older wet method with a cover slip in that the specimen does not slip around under the lens making it difficult to see the capsule. Even the smallest capsules are clearly apparent with this method and the differentiation between negative and positive tests is very sharp.

Each specimen as it came in to us was recorded from the hospital, laboratory or locality from which it came. A direct smear stained by the gram method was made in order to determine if gram positive lancet shaped diplococci were present in the specimen and their relative number. If several were seen a direct typing was attempted by the above method using every group. I wish to stress particularly this point. As all of you probably know, it is much more convenient to type first with mixtures of sera rather than set-ing up each individual type. We used the mixtures A, B, C, D, E, and F as packed by Lederle, Inc. These groups are mixed in such a manner that the most common types are in the lower groups, i. e., A, B, and C. Many technologists make the mistake of not looking at all groups if they find a swelling in one. Every group should be examined to avoid confusing mouth strains with the type causing the infection. An example will serve to illustrate the importance of this. A laboratory worker, not a medical technologist, typing a specimen of sputum in a small hospital reported a Type I infection. The physician on the case immediately started giving Type I therapeutic serum with no results. The family of the patient objected to spending so much money on therapy that was not helping the patient. The patient became so much worse that the doctor decided to have the typing checked and sent a divided specimen to one of the larger hospitals in the city and to a commercial laboratory. One of them failed to get a typing and sent the specimen to us to be typed. On direct typing we obtained some swelling of the capsule

with both Types I and II antisera and on mouse inoculation found only Type II. The patient was given Type II therapeutic sera also and recovered. In another case a laboratory reported a Type III on a sputum specimen from a doctor who was suffering from a slight case of influenza. This worried the family and the doctor himself so much that we were asked to check the specimen. We found a few Type III with very large capsules but on examining all the groups we found the capsules on many organisms swollen in Group D. This organism later proved to be a Type XI and the Type III a mouth strain.

If no type could be obtained by the direct method or if few or no diplococci were seen the specimen was injected into a white mouse. If the mouse became ill within a few hours a puncture was made and fluid withdrawn from the peritoneal cavity. A smear was made of the peritoneal fluid to determine if pneumococci were present. If gram positive diplococci were seen a typing was then done. If no type was obtained on mouse inoculation and diplococci were present the fluid withdrawn from the first mouse was injected into a second mouse and at the same time cultures were made from the peritoneal fluid of mouse 1 to determine if the organism was a pneumococcus. If the organism proved to be pneumococci, fluid was withdrawn from the second mouse and another typing done. In one instance, in which the specimen was three days old when it reached us, it was necessary to run it through three mice before the specimen could be typed. The capsule was extremely small but very clear and distinct. The organism gave a swelling with Group F antisera and proved to be Type XXXII. Incidentally this was the only Type XXXII found or reported in the entire 263 typings. Even with the smallness of the capsule there was no mistaking its specific type. The culture was only slightly virulent for mice but by rapid passage in this manner the culture finally killed the third mouse.

We found a great variance in the virulence of the different types for mice. Cooper and others (12) report the same findings. They found Types IV, II, III, I, VIII, XI, XVIII, XXII, and XXV to be very virulent to mice; Types VI, VII, XIII, XIV, XVII, XIX, XX, and XXXI moderately virulent; Types XV, XVI, and XXI only slightly virulent and the others ranged from slightly to highly virulent. Perhaps the most interesting specimen which we had was one from a case in our own university hospital. The patient, an 18 months old child, was admitted to the hospital with a diagnosis of meningitis. A spinal puncture was made soon after admission to the hospital and the fluid sent immediately to the laboratory. The baby was admitted on a Sunday night. The technologist on duty reported that he saw several gram positive diplococci with a fairly large capsule apparent which did not react specifically with any

typing sera kept at the hospital. Early Monday morning the specimen was sent to the Medical School and a direct typing was attempted using all 6 groups and all individual types with no success. A portion of the specimen was injected into a white mouse and a portion cultured on blood agar and brain heart infusion broth. In eight hours time the mouse showed no signs of illness but a sample of the peritoneal fluid was found to contain a few diplococci. The first mouse was killed, the peritoneum washed out with sterile saline and the washings injected into a second mouse. Examination of the cultures showed the organism in chains with capsules apparent. These organisms gave a greening of the blood agar, would ferment inulin slightly but were not bile soluble on first culture.

A second specimen of spinal fluid was sent to us Monday afternoon. A direct smear showed many gram positive diplococci all in short chains. None of these chains were seen in the first specimen. We again attempted a typing directly on the spinal fluid and also on the cultures using all typing sera with no results. The second mouse did not become ill but still showed diplococci in the peritoneal fluid. The baby died on Tuesday. At autopsy the meninges were found to be covered with a thick pus filled with gram positive diplococci. Cultures, mouse inoculation and a direct typing were all done using the diplococcus filled pus. No direct typing could be obtained. The mouse injected with the pus became ill and its peritoneal fluid was injected into another mouse. Meanwhile we sent cultures to two eastern laboratories where a great number of typings are being done and to the laboratory of the United States Public Health Service in Washington, D. C. They all reported their cultural characteristics to be similar to those we had obtained. Both our cultures and those sent away became bile soluble and finally on the ninth rapid transfer we were able to type it as a V. We received the same report from two of the laboratories to which the specimens were sent for checking.

I mention this case because it was so unusual. In no other instance did we have such difficulty. Even with specimens several days old sent in from all over the state we were able by mouse inculation, usually in 8 hours, to determine the type. With fresh specimens from Oklahoma City we were able to do the typing within a few hours, varying in accordance to the time we had to work with the sample. Where pneumococci were actually present age did not seem to affect the typing, though sometimes in a highly phagocytosed specimen or in samples in which the capsule had been autolyzed by enzyme action in the sputum we had to run them through mice in order to have them regain the capsule. Beckler and MacLeod report (15) that age has little to do with the positive reaction. Cooper and Walter (16) report that they obtained a direct typing on a specimen

after two weeks in the ice box. Of course in routine laboratory work where time is an important factor fresh specimens are a necessity as well as a decided advantage for rapid work. Specimens sent in warm weather of course should be iced as overgrowth occurs at room temperature. In one instance we received a specimen so overgrown with pyocyaneous that we could not purify it and the bacilli killed each mouse injected.

For the period from December 1, 1937, to May 1, 1938, we have records of 324 cases. Of this number 267 were proven definitely to be pneumococcal in origin and the type determined. During this five months period we found the type incidence of the entire state to be as follows:

Type I	77 cases—29.27%	Type XVII	2 cases— .76%
Type II	37 cases—14.06%	Type XVIII	1 case — .38%
Type III	33 cases—12.54%	Type XIX	4 cases— 1.51%
Type IV	8 cases— 3.04%	Type XX	2 cases— .76%
Type V	10 cases— 3.80%	Type XXI	5 cases— 1.90%
Type VI	3 cases— 1.14%	Type XXII	3 cases— 1.14%
Type VII	50 cases—19.01%	Type XXIII	5 cases— 1.90%
Type VIII	6 cases— 2.28%	Type XXIV	0 cases— 0.00%
Type IX	3 cases— 1.14%	Type XXV	1 case — .38%
Type X	2 cases— .76%	Type XXVI	0 cases— 0.00%
Type XI	2 cases— .76%	Type XXVII	0 cases— 0.00%
Type XII	1 case — .38%	Type XXVIII	0 cases— 0.00%
Type XIII	0 cases— 0.00%	Type XXIX	1 case — .38%
Type XIV	5 cases— 1.90%	Type XXX	0 cases— 0.00%
Type XV	0 cases— 0.00%	Type XXXI	0 cases— 0.00%
Type XVI	1 case — .38%	Type XXXII	1 case — .38%

4 Mixed Types:

2 mixed I and II
1 mixed I and VII
1 mixed III and XI

From the above data collected to date we find that the most prevalent types of pneumococcal infection in Oklahoma in the order of their prevalence to be Types I, VII, II, III, V, IV, VIII, XIV and XXIII. Since therepeutic sera is now available for Types I, II, III, IV, V and VII (horse), VI, VIII, XII, XIV and XVIII, we have therapeutic sera available for all of the types that are prevalent in our state except XXIII.

It is interesting to note that the type incidence as shown by the largest single series of cases we could find in the literature, that of Bullawa and Wilcox (22) made in the city of New York roughly parallels that of Oklahoma. They report a series of 4,048 cases of endemic pneumococcal infections covering a period

of seven years 1928-35. Of this number 3,066 cases in adults and 749 cases in children were typed. They found the most prevalent types in adults to be Types I, III, II, V, VIII, VII, IV, XIV and IX in the order named with Type I leading with a percentage of 23.7%. The next highest was type III with a percentage of 9.7. In children they found the most prevalent types to be XIV (17.5%), I (16%) and VI (10.7%). Our most prevalent type was I (29.27%) with VII (19.01%) second. We could make no distinction between adults and children since those cases reported from outside the city gave no age nor clinical history except that each case had been clinically diagnosed by the physician as pneumonia. Next year we hope to be able to obtain this information, as well as securing a much larger number of typings. Our state statistician reports that the state had a morbidity rate of 2,067 cases of pneumonia (all types) in 1937. How many of these were due to pneumococci we are unable, of course, to determine. We hope in the course of a few years to be able to obtain typings on the majority of all pneumococcal infections in the state.

Summing up the progress made toward achieving our objectives:

1. We find the Neufeld method of typing to be highly satisfactory and accurate, especially when used in conjunction with mouse inoculation when a direct typing cannot be done. Along with other workers using the Neufeld method we found the following things to be of importance in successful typing:

(a) Clean, dry, sterile containers of clear glass with wide mouths and no disinfectant added.

(b) Time of course is an element where the life of the patient is concerned and also in getting specimens to a central laboratory before overgrowth occurs, especially in warm weather.

(c) Plenty of antiserum must be used and thoroughly mixed in order to reach all organisms possible in the specimen. This is especially true when only a few pneumococci are present. We use roughly a proportion of 1 part specimen to 16 parts sera for the mixed group typing and 1 part specimen to 4 parts sera for the specific types in the groups. Consistent results cannot be obtained by using equal parts of specimen and sera.

(d) In typing small children, or infants it is best to use the method suggested by Vinograd and Park (19) namely to tickle the back of the throat with a sterile swab causing the child to cough then twirling the swab in brain, blood

broth and incubating a few hours before typing is attempted. Wittes and Bullowa (17) describe a method of gastric aspiration to obtain pneumococci that may have reached the child's stomach through swallowing of sputum. We have had no experience with this method but they report excellent results.

(e) In working with thick mucoid specimens in which the serum cannot reach the organism either wash the sputum thoroughly with saline and type the thinner washings or dissolve the mucous using the method of Rosenthal and Sternberg (7). They use a solution composed of 15 grams borax, 15 gms. Boracic acid, 3% hydrogen peroxide and 100 c.c. water. This is added a few drops at a time to 1 to 3 c.c. of sputum. The mixture is agitated either with an applicator stick or by shaking. After centrifuging three layers are formed, a foamy pellicle, a clear or opalescent zone and solid material.

(f) Be sure and get true sputum if at all possible to avoid mouth strains.

(g) Set up and examine all 6 groups for mixed infections. It is not necessary to examine all 32 types but every type in a particular group that gives a positive swelling should be examined.

(h) In case of cross agglutination or swelling as sometimes occurs between VI and XXVI, III and VIII, XV and XXX, etc., titrate the reaction by diluting the typing sera and repeat the typings until only one Type gives a positive reaction.

2. We feel that we have made a start toward determining the type incidence of pneumococcal infections in the state. Next year with a larger series of cases the incidence may vary.

3. More and more interest has been manifested in typing. We contacted 136 hospitals, state institutions and laboratories and received replies from 42 of them. 23 of this number reported that they did no typing, 11 reported that they used only Groups A and B. 8 reported that they used all groups and Types. Since we started this survey we have learned that 4 more hospitals who did not reply have started a typing service as a result of the publicity.

4. It is too early of course for our work as technologists to bear fruit toward helping reduce the mortality of pneumonia by serum therapy, but this is our ultimate and highest goal. This work indicates that the types that seem to be most prevalent in our state can be treated, since therapeutic sera is already avail-

able for most of these types. By working together as a state unit and having a central typing station for checking samples, where time and equipment is available and in which work can be done without thought of personal gain, we feel that we have made a definite step forward in the public health program of our locality. We hope that other state organizations will be inspired to join us in this type of work.

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A CASE OF TRICHINOSIS

By EMMA WEHRLE, M.T.

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Tiedeman first observed the encysted larvae causing trichiniasis in 1822. The parasite itself was observed by Sir James Paget in 1835 and was described by Richard Owen as trichina spiralis. Bowditch of Boston described the parasite in man in America in 1842. Joseph Leidy found it in American pork in 1847.

Trichina spiralis is the most dangerous and common nematode which invades the muscular tissue. The life history of the parasite is important in the spreading of the disease. As a matter of fact, the organism occurs in three different stages, the adult, the embryo and the encysted larva. The intestinal form of the parasite is larger than the one in the muscle. The trichina of the muscle varies from 7/10 to one millimeter in length. The intestinal female parasite is larger, measuring approximately three millimeters. The males are about half that length. Their occurrence is generally due to the accidental consumption of imperfectly cooked pork. As a matter of fact, the microscopic examination of pork for trichinae was discontinued in 1907. The federal examination of millions of hogs showed about two per cent of trichina infection. Riley and Scheiffley examined 117 cadavers in the University of Minnesota. They found evidences of trichinosis in twenty of these subjects who were never recorded as being infected. The trichinellae in meat cannot be destroyed through the usual process of pickling and smoking.

The encysted larvae do not reach the state of sexual differentiation. The adult form only develops when infected meat enters the digestive tract of man. The encysted parasites escape from their capsule and the capsule is subsequently destroyed by the action of the gastric juice of the stomach. The young organisms do not leave the human body, but become encysted in the muscles. (Many experimental studies gave this evidence.) In two or three days the adult trichina is developed and ready to enter the duodenum and jejunum, where they mature. After copulation the males die and the females penetrate the intestinal mucosa, where they lodge between the epithelium and connective tissue. The ovae are deposited in the lymph spaces, where, after eight days, they are carried along by the lymph stream to the lungs, heart, brain and serous cavities. The majority will be distributed throughout the striated muscles, which are better

suited for the encystment. Those which survive become encapsulated larvae. The trichinellae, in their encysted condition, may remain alive and capable of development for years. The average incubation period after eating such infected meat is about ten days.

The clinical picture of a 22-year-old housewife, white, no children, was:

November 29, 1936, patient ate some roast pork (ham cut). She stated she preferred her meat rather rare. December 3, 1936, she ate a pinch of raw hamburger. She felt badly on December 4, 1936; noted pain in muscles, eyes, and swelling of eyelids (could hardly see). Temperature 103-104, blood pressure 102/80. The laboratory examinations December 9, 1936, showed:

	Leucos.	17,100
	Polyn. leucos.	43%
	Eosinoph.	54%
	Mature lym.	3%
	Serum for Kahn:	Neg.
	g. n. s.	
Urine:	Ac. alb.	1 plus
	Sugar	—
	Bile	trace
	Hyaline casts	2 plus

Blood was taken from a vein to demonstrate the trichinae. Twenty cc. of blood were treated with three per cent of acetic acid and thoroughly centrifugated, then washed in distilled H_2O and recentrifugated for ten minutes. (This was repeated three times to remove the acid, which would prevent a good stain.) Glycerin albumen was thinly spread on a few slides. The parasites sediment was applied and dried at room temperature for one-half hour, then fixed with methyl alcohol for five minutes, air dried, stained with Giemsa, Wright or haematoxylin eosin. (The enclosed sediment smear was stained with haematoxylin eosin. A hand-drawn picture was made for the demonstration of the possible different sizes of trichinae embryos, but due to the impossibility of finding a printed picture of these parasites, I must reserve my opinion to some authority.

December 11, 1936, another blood sample was taken from the vein with the same finding in respect to trichinae embryos. The differential blood showed 21 per cent of eosinophil.

December 18, 1936, blood was taken from vein with negative results, eosinoph. 16%.

Stool was examined and proved to be negative.

December 31, 1936, eosinoph. count 14%.

Serum for precipitin test with undiluted antigen was positive.

January 4, 1937, biopsy of muscle pieces from the biceps were quickly embedded (3 hours) and cut in serial, then stained with haematoxylin eosin. Every specimen shows some of the trichinae capsules embedded in the muscle.

January 23, 1937, patient showed 31 per cent of eosinoph.

Serum for precipitin test was positive at a titer of 1-64.

Control serum negative.

Patient had a few more blood examinations done, which showed a decrease of the eosinoph. (7%).

The patient had a complete recovery and is apparently in perfect health.

TEST FOR AMMONIA GAS IN URINE

By A. P. YOUMASHEF

San Francisco, California

The normal urine under the influence of microorganisms is subject to decomposition, and after several hours the urea gradually transformed into ammonium carbonate and free or volatile ammonia.

Such transformation can be observed usually when the urine stands open or exposed to high temperature and may be detected by ammoniacal odor of the urine. Also such odor can be obscured by many others odourous matters as drugs, feces, etc.

Sometimes such ammoniacal odor may be noticed in fresh urine and then it indicates that decomposition of urine takes place in the bladder.

A sample test which can positively show the presence of ammonia in fresh urine should be of assistance to the laboratory worker.

Take in test tube 5 cc. of urine and add 1 cc. of concentrated hydrochloric acid. If urine contains ammonia, a dense cloud of "smoke" will appear above the fluid.

To perform a quantitative test for ammonia, sensitive enough for practical purpose, prepare a series of tubes containing diluted ammonia water—1%, ½%, ¼%, and ⅛%, 5 cc. in each tube, and in fifth tube 5 cc. of urine to be examined. Add 1 cc. of concentrated hydrochloric acid to every tube.

A comparison of the cloud of "smoke" in the urine tube with solutions of ammonia of different strength will indicate approximately the amount of ammonia in the urine.

To prepare 1% ammonia water take 1 cc. of ammonia water 28 or 29% strength and dilute it to 28 cc. with distilled water.

TISSUE STAINING*

By L. H. WILLIAMSON

Nix Hospital Laboratory, San Antonio, Texas

I will make no attempt to introduce any new stains or any new methods of staining, but will confine myself to a discussion of a few of the many important steps that are required in successful tissue staining.

Most Medical Technologists consider tissue staining a difficult procedure. It is not, if one will pay strict attention to all the small steps that are necessary to complete a satisfactory piece of work.

There are many tissue fixatives in use. Different kinds of tissue require different fixatives; also different stains require different fixatives. The most common fixative used is ten percent fomalin. The tissue must be well fixed regardless of the kind of fixative used. The length of time that a piece of tissue must remain in the fixing agent is governed by the size and kind.

For paraffin sections the next step is dehydration, this is very important. If a piece of tissue is not well dehydrated it is impossible to impregnate it with melted paraffin, which is necessary for cutting.

For dehydrating agents alcohol, Dioxan, and acetone are used. These liquids are used in common dessicator jars with Drierite in the bottom part of the jar. These liquids can be redistilled and used again. The fragments of tissue are put into seventy percent alcohol for four hours. From the alcohol they are placed in the first jar of Dioxan for two hours, and into a second jar for the same length of time. They may be left in the Dioxan for days without harm. After dehydration in Dioxan tissues are placed in acetone for one hour. They are now ready to be placed in paraffin.

The paraffin is prepared in the following manner:

To a good grade of paraffin is added from five to ten percent beeswax, which must be pure wax. The addition of beeswax prevents crumbling and cracking when being cut. It coheres during slicing and facilitates cutting very thin slices. Tissues

* *Read before the American Society of Medical Technologists, San Francisco, Calif., June, 1938.*

may be left in the paraffin-wax mixture for two weeks and no harm will be done if a well regulated oven is used.

A convenient, economical method of embedding tissues is to place them in small glass salt cellars, which have been coated with glycerin. The glasses are filled with the wax mixture and placed in cold water to harden. With the addition of beeswax to the paraffin it is not necessary to cool the mixture as rapidly as with the paraffin alone, for the addition of the wax prevents crystallization of paraffin. When hardened the blocks containing the tissue are ready to be cut and mounted on the microtone head.

For perfect sections any good microtone may be used. A very sharp knife is necessary. The best method of sharpening a knife is on a glass disk that is mechanically operated.

After being cut the ribbons of tissue are floated onto water at a temperature of 50 degrees C., then onto slides, or some workers mount them directly onto slides. Several substances may be used to fix tissues to the slides, such as egg albumen or gelatin, prepared as follows:

To 1 gram gelatin add 3 c.c. water; let stand for a few minutes to swell, then bring to a boil. The gelatin will go into solution ot once. Dilute the mixture to 25 c.c. It is best to make small amounts of this solution for it does not keep well.

In doing any of the tri-chrome stains it is necessary to use the gelatin mixture to fix the sections to the slides as most of these stains are used hot. Also in using these stains it is necessary to coat the slides with celloidin after the paraffin is removed. The celloidin helps hold the tissue on the slide through the long period of washing.

The next step is getting the paraffin out of the tissue sections. For this xylol is used. The slides are soaked in xylol for ten miutes, from this to alcohol, then into running water. The sections are then ready for staining.

The most common stain used is Hematoxylin-Eosin. For this stain sections may be cut at five to ten micra in thickness. After the paraffin is removed the sections are put into 95 percent alcohol, then into running water. From the running water the slides are placed in the Hematoxylin from a few seconds to fifteen minutes. It is well to overstain then decolorize in a weak acid, or acid-alcohol solution. The slides should be decolorized until the Hematoxylin is barely visible, then well washed. The

next step is to restore the blue of the Hematoxylin by exposure to ammonia vapor. This is done by making a one percent aqueous solution of strong ammonia, placing two c.c. of this in a Coplin jar, and standing the slides in the jar and closing the jar. Then washing them well. After washing, the slides go into 95 percent alcohol, a weak alcoholic solution of Eosin, for a counter stain, three changes of absolute alcohol, carbolxylol (for one hour), Xylol (one hour, or longer). No harm is done if sections are left in the clearing reagents for several hours.

For the tri-chrome stains more careful work is necessary. Sections must be cut very thin, 3 to 5 micra in thickness. Sections must be fixed to the slides with gelatin and dried in an oven at 40 degrees C. A small glass of Formaldehyde must be kept in the oven with the tissues, to render the gelatin insoluble. Sections must stay in the oven a few hours. The paraffin is removed from the sections with Xylol and the slides must be coated with celloidin and be placed in alcohol to harden the celloidin.

The tri-chrome stains are used for critical study and research in histology, and the success of staining depends upon using the best stains and very careful technique.

EDITORIAL

THE FUTURE OF THE MEDICAL TECHNOLOGIST*

By M. BODANSKY, M.D.
Director of Laboratories, John Sealy Hospital, Galveston, Texas

I am here as the understudy of a truly great man, a man who has devoted many years of his life to clinical pathology, a man who has also enlisted in the service of those who must bear a large share of the heavy burdens of the clinical laboratory, the medical technologists. A serious illness has prevented my good friend and colleague, Dr. Philip Hillkowitz, from fulfilling his engagement to speak to you this evening, but I am glad to report that he is now on the road to complete recovery, and it is because of this bright outlook for my friend and yours that I am able to express my sincere pleasure of being with you. I am honored to have been called upon to speak to you, though I realize and you too must realize that I am not equipped with the knowledge, the experience, the wisdom, or the vision of Doctor Hillkowitz.

The status of the medical technologist is a problem of paramount importance to you for on it depends your livelihood and your sense of professional security. It is also a problem which vitally concerns the clinical pathologist. Between the clinical pathologist and the medical technologist, there has grown up a relation of understanding, mutual respect, and confidence for which there is no parallel in other walks of life.

In most institutions the clinical laboratory has had a very humble beginning. There was a time within my own memory when the laboratory of many hospitals was more a figure of speech than a living thing. Somewhere, either in the basement, or hidden in the attic, or lost behind the back stairs were a table, an old microscope, a few reagent bottles, a handful of test tubes, and some slides, all in disuse, all covered by a many-months layer of dust. That, ladies and gentlemen, was the average "laboratory" in those remote days 25 or 30 years ago. If there were directors attached to such laboratories, their influence could not have been great, certainly their position could not have been an exalted one.

To be sure in a few favored institutions a different situation prevailed and there are some among the older members of the

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* *Read before the Texas Society of Medical Technologists at Waco, Texas, October 15, 1938.*

American Society of Clinical Pathologists who as pioneers maintained fairly substantial private or hospital laboratories, but, by and large, the possibilities of the clinical laboratory were not realized or utilized by the great majority of medical practitioners. The change to the present has come about largely because greater emphasis has been placed on laboratory training in the medical curriculum. A new generation of physicians has arisen. Higher standards of medical practice have brought about a greater sense of the importance of laboratory diagnostic procedures in clinical medicine, and with this change in attitude there has descended on the shoulders of the clinical pathologist an enormous load: a load which he alone is unable to carry; a load which he must share with others. To help carry a great part of this load is doubtless the reason why technicians were born.

The position of the first technician was obviously an exceedingly humble one, but in this respect you who now follow this profession do not stand alone. Similar conditions existed in other walks of life. By way of illustration, I shall recall the following incident, which takes us back not much more than 20 years, to the time of the World War. There was a factory not far from where I lived at the time that had obtained a contract to manufacture certain war materials, but one of the conditions imposed by the government was that this factory would have to employ a chemist for the purpose of testing the materials used in their manufacture. The owners and executives of this organization had no conception whatever concerning the functions and purposes of a chemist, or as to what manner of man he might be, and so it happened that after deliberating on this matter, one of the owners, strolling casually in the yard of the factory, recalled that Mike, the pipe fitter, had been to high school, and so on the basis of this superior education, he was urged to accept and did accept the position as chief chemist. It is no secret that the first laboratory technicians were created in about the same way. Some pretty little girl with only a part of a high school education, or even less, considered bright by some medical acquaintance was taught to test urine for sugar and albumin and to determine hemoglobin by the Talquist method, and, lo and behold, there she was a "finished technician."

I do not offer this by way of criticism, not at all; it could hardly have been otherwise at the beginning. I merely cite this to illustrate that like every other profession that of the medical technologist had its roots in very uncertain beginnings. Conditions obviously could not continue in this fashion for they were engendering many abuses, and it was necessary to create certain

standards in respect to educational qualifications for those engaged in medical technology. In fixing the educational requirements for admission to the laboratory training schools, in supervising the work in such schools and in examining eligible applicants the American Society of Clinical Pathologists through its Board of Registry has rendered a very valuable service to medicine.

Clinical Pathology is a medical specialty and as such can be practiced only by the licensed medical graduate who has qualified himself by years of post-graduate study. Upon him rests the responsibility of the work of the laboratory. It is he who must, in the last analysis, assume direct responsibility, legal or otherwise, for all mistakes that happen in the laboratory, and many that do not.

Between the clinical pathologist and the medical technologists who in the larger laboratories do the greater part of the actual work; there are no grounds for conflict, but on the contrary, there is a fundamental and sound basis for sympathetic and friendly cooperation. The American Society of Clinical Pathologists has fostered and continues to foster and promote the scientific, economic and social status of the medical technologist. At this juncture, I must make it clear that this has carried nothing of the paternalistic attitude with it. Indeed, I personally, feel, and I am sure that many of my colleagues are in accord with my view, that you have now come of age, that you have your own future in your own hands.

And what may this future be? I see certain signs which must be of great significance. Enormous strides in technic are being made and these strides affect every phase of clinical pathology. A blood count and hemoglobin estimation are no longer sufficient; other criteria are utilized in diagnosis of blood disorders, and these require a great deal of precise laboratory work. Routine clinical bacteriology is becoming more than the examination of smears. The demand is for precision in the identification of the offending organism. In the field of biochemistry, the procedures that the clinician is calling for with greater and greater insistence perplex even those who have devoted a great part of their life to chemical analysis. As you well know, in serology, because of the universal interest in syphilis control, higher standards of laboratory diagnosis are being strongly urged.

If present trends continue, it is inevitable that the future of the properly qualified technologist should improve. There will be considerable expansion in opportunities, from which must

follow a higher level in regard to both professional and economic status. Evidence of this is all around us. Instead of the children who formerly applied for admission to laboratories for training, we now have persons with university degrees, with honors in bacteriology and chemistry, who are entering training in medical technology. I realize that outside of hospitals and clinics, the need for highly specialized training in medical technology may not be so urgent, but even in laboratories serving the needs of one or two clinicians, higher standards of work will do no harm.

Such a future as lies before you, you need not view with apprehension; it is bound to elevate your professional standing. Of course, one cannot live by adulation alone. It is nice to be respected by those whom you serve and it is fine to be recognized as a person of education and technical skill, but there should go with these qualifications adequate remuneration. This is obviously a problem which is at present occupying your attention and for which you are seeking a solution; it brings us to the question of whether your professional and economic status will or will not be improved by state licensure.

As in every perplexing problem arguments may be presented on both sides. Without critical analysis, it might seem that state licensure would afford legal recognition of your vocation; but I assure you that the value of such licensure is negligible and would be overwhelmingly eclipsed by its many disadvantages.

How will state licensure affect your professional status? I believe under prevailing conditions it will do more harm than good. Whatever the ultimate benefits might be, it is inevitable that if state licensure were to go into force, the immediate effect would be the inclusion of a host of poorly trained, poorly qualified technicians, persons altogether ineligible for recognition by the National Registry. The Registry, as you know, was created to provide well trained, competent and ethically-minded laboratory personnel, and also to safeguard the interests of medical technologists. These objectives are being fulfilled by the Registry. No politics, no personal ambitions play the slightest part in the Registry. The Registry has achieved a uniform standard for medical technologists all over the United States. So important, so fundamental, so constructive has been the program of the Board of Registry of the American Society of Clinical Pathologists that it has enlisted the whole hearted support, not only of the 5,000 registered Medical Technologists in the United States, but of such governing bodies as the American Hospital Association, the American College of Surgeons, and the Council on Medical Education and Hospitals of the American Medical Associa-

tion. I am quite certain that if state licensure represented a step forward for medical technology as a profession, these organizations would support such a step. However, they have taken the opposite view; they recognize, as does the American Society of Clinical Pathologists, that state licensure would be a step backward, that it would do more harm than good, that it would unloose and inflict on the medical profession and the public at large an army of poorly trained, ill-begotten technicians, the products of unregulated commercial laboratory schools. In my own opinion, it would be a return to the situation which existed ten years ago, when I first began to train technicians in our laboratory at the John Sealy Hospital. At that time, I found prospective employers who looked upon themselves as philanthropists when they offered a technician thirty dollars a month for fulltime work, which meant twelve or more hours a day. There have been enormous strides since then, yet I do not believe that the ideal situation has been attained. Your Registry would be the first to concede this; your Registry that has long recognized that the one method of combating exploitation and other abuses was to develop a higher type of technician, to set standards of achievement that could be met only by schools organized primarily for education and not for profit. To abandon the present high standard at this time would mean the revival of the commercial schools that are now in the process of collapse and dissolution, and the creation of many similar ones.

A study of the problem drives me to the convicion that state licensure is not the solution to your problem. The solution lies along other lines, lines which are more definitely constructive. Support of the Board of Registry carries with it no restraints other than those of maintaining high standards of technical performance and of ethics. The Board encourages your local societies and national organization. Speaking as an individual, I would urge you to strengthen your technical journal and to support by your subscriptions, the technical supplement of the American Journal of Clinical Pathology. Above all would I urge you to promote your technical skill, for in the future more and more will be expected of you. I am confident that a brighter future awaits those who can meet the challenge by attaining to higher and higher levels of proficiency.

ABSTRACTS

STUDIES ON THE RETROGRESSIVE CHANGES OF TUBERCLES: H. C. Sweaney, A. E. Tillotson and V. Kozielek. Am. Rev. Tuberculosis, vol. 37, No. 5, May, 1938, p. 484.

A presentation of the steps involved, with their mechanism, in the disintegration of old primary tubercles.

COMPLEMENT FIXATION IN AMEBIASIS: M. Paulson and J. Andrews. Arch. of Int. Med., vol. 61, No. 4, April, 1938, p. 562.

Report of complement fixation results with technique of Craig, Sherwood-Heathman and Arnold on cases of known, doubtful and negative amebiasis. Fair agreement was found with most successful results with the Arnold antigen in Arnold's laboratory. The authors believe the complement fixation test to be insufficient for diagnosis at present in the absence of positive microscopic findings.

PNEUMONIA FROM THE STANDPOINT OF THE LABORATORY MAN: W. Dodds. Jour. Ind. State Med. Assoc., vol. 31, No. 3, March, 1938, p. 113.

Dr. Dodds stresses the necessity of having a specimen from the lung, as it is possible to get Pneumococci from the oropharynx to give the typing reaction without being the causative organism. Repetition of examination to be certain that the causative organism has been typed are urged. When sputum is difficult to obtain, material aspirated from the stomach may also be used. When the infection is spreading to another lobe, the sputum should be typed again as this may be due to another Pneumococcus.

STUDIES OF ANAEROBIC STREPTOCOCCI FROM PULMONARY ABSCESSES: C. Weiss and D. Mercado. Jr. Inf. Dis., vol. 62, No. 2, March, 1938, p. 181.

Two types of anaerobic streptococci isolated from material taken from lung abscesses resembled S. evolutus and S. micros. Their cultural characteristics, pathogenicity and immunological reactions are given.

THE TAKATA REACTION IN THE BLOOD SERUM: Am. Jr. Digestive Dis., vol. V, No. 4, June, 1938, p. 231.

The method is given with tabulation of the results obtained in various diseases. Mechanism of the test is discussed. This test is applicable in differentiating cirrhosis from carcinoma with metastases in the liver.

A STATISTICAL EVALUATION OF THE LEUCOPENIC INDEX IN ALLERGY: M. Loveless, R. Dorfman and L. Downing. Jour. of Allergy, vol. 9, No. 4, May, 1938, p. 321.

Techniques previously used are discussed. The method used in the survey is described with the errors involved. The authors report that the leucocyte count did not vary with the ingestion of incompatible foods. Subcutaneous injection of ragweed extract in ragweed-sensitive patients did not cause any significant variation in the leucocyte count.

THE INFLUENCE OF ANEMIA ON BLOOD SEDIMENTATION: J. Cutler, F. Park and B. Herr. Am. Jr. of the Med. Sci., vol. 195, No. 6, No. 795, June, 1938, p. 734.

Rapid settling of erythrocytes is the result of the formation of rouleaux or aggregates and this is dependent upon the plasma. Thus, the authors state, if this is removed to correct for anemia, the aggregation rate is interfered with and sedimentation is correspondingly slower. When multiple readings are taken, the shape of the curve will indicate disease while the index will show anemia.

FLOTATION METHOD OF SPUTUM EXAMINATION: C. Richard Smith. Amer. Rev. of Tuberculosis, vol. 37, No. 5, May, 1938, p. 525.

Outline of a method in which sputum is liquified with NaOH and shaken with xylol. The suspension of organisms is placed on slides and stained using 1% aqueous picric acid as a counterstain. The author claims an average of 85 times as many acid fast organisms demonstrated by this method as by the direct smears. The organisms are said to be better distributed and the slides are cleaner than in concentration methods.

COLORIMETRIC ADJUSTMENT OF THE REACTION OF CULTURE MEDIA: P. H. Symons, Dept. of Biochem., So. African Instit. for Med. Research, Johannesburg. So. African J. of Med. Sc., Vol. 3, No. 2, Apr., 1938, p. 53.

Procedure is described to achieve a maximum of simplicity and speed without sacrificing accuracy and eliminating solutions of alkali of known normality.

A DEVICE FOR ELIMINATING CALCULATIONS IN MACLEAN'S METHOD FOR BLOOD SUGAR ESTIMATIONS: P. H. Symons, So. African J. of Med. Sc., Vol. 3, No. 2, p. 51.

The device consists of a specialized slide-rule with the burette as the slide.

BOOK REVIEWS

CLINICAL CHEMISTRY IN PRACTICAL MEDICINE, by C. P. Stewart, M.Sc. (Dunelm.), Ph.D. (Edin.), Lecturer in Biochemistry, University of Edinburgh; Senior Biochemist, Royal Infirmary, Edinburgh and D. M. Dunlop, B.A. (Oxon.), M.D., F.R.C.P.E., Christison Professor of Therapeutics and Clinical Medicine, University of Edinburgh. Second edition, 1937. William Wood and Company, Baltimore, Md. Price, $4.00.

The rational foundation of biochemical tests are explained to make a better understanding of the mechanism of the pathological processes concerned. The interpretation and significarce of these tests are stressed. As the authors state, the laboratory may be a valuable aid to the clinician but unless the tests are understood and properly interpreted they are of no value in aiding with the diagnosis or prognosis. So rapid has been the advance in laboratory work of all types that today there is not a branch of medicine or surgery that cannot be aided by it. The purpose of this book is to furnish the clinician with the information he should possess for the proper correlation of his clinical findings with those of the laboratory pertinent to the individual case. Detailed technics for the performance of biochemical tests are not given but sufficient detail is included to clarify the text. The preparation of the patient for certain tests and the proper collection and preservation of specimens are given, the latter for examination either soon after obtaining the specimen or for shipment and examination at a distant laboratory.

This informative book is well written and the material is clearly presented with a minimum of theory. On controversial subjects the authors express their views and opinions after presenting those of other authorities. Chapters are included on basal metabolic rate, the mechanism of neutrality regulation, glycosuria, albuminuria, stomach contents, cerebro-spinal fluid, pregnancy, blood calcium and phosphorus, sedimentation rate and tests of renal, pancreatic and hepatic function.

ESSENTIALS OF PATHOLOGY, by Lawrence W. Smith. M.D., Professor of Pathology, Temple University School of Medicine; Formerly Assistant Professor of Pathology, Harvard Medical College; and, Associate Professor of Pathology, Cornell University Medical School and Edwin S. Gault, M.D., Associate Professor of Pathology, Temple University School of Medicine. With a Foreword by James Ewing, M.D., Memorial Hospital, New York City. D. Appleton-Century Company, Inc., New York and London, 1938. Price, $9.00.

In arriving at a clinical diagnosis the practitioner must have a picture in his mind's eye of the underlying pathology. Sometimes the pathological condition can be removed and the tissue examined and sometimes not. In any case the physician must, or should, always have a clear picture of the probable or suspected pathology present or determine whether the clinical findings indicate a functional condition. This differentiation is not always easy and the diagnostic acumen of the clinician may be taxed to the utmost. In this regard Essentials of Pathology by Smith and Gault is a distinct aid to the clinician and the student because it combines the clinical picture with each pathological condition described. This is a new departure from the usual presentation of texts on pathology and no doubt will meet with popular approval from students and clinicians alike. Essential, yet adequate, facts of pathology are given in sufficient detail for all practical needs. One or several complete case histories including the autopsy or tissue findings are given with each pathological condition described to illustrate the clinical picture of the latter. This constitutes a veritable series of clinical-pathological conferences which have always been a most effective and popular means of teaching clinical medicine. There are 679 illustrations of photomicrographs and gross tissue specimens some of which are in color. There are many blank pages for the reader's own notes.

AN INTRODUCTION TO BACTERIOLOGICAL CHEMISTRY, by C. G. Anderson, Ph.D. (Birm.), D.Bact. (Lond.), Lewis Cameron Teaching Fellow, Bacteriology Department, University of Edinburgh. William Wood & Company, Baltimore, Md., 1938. Price, $4.00.

This work is adapted to the needs of students and possibly research workers who feel the need for some understanding of the metabolic behavior and chemical nature of organisms. It is assumed that the reader has an elementary knowledge of organic chemistry and of a certain amount of bacteriology. It serves as an excellent introduction to more technical works and periodicals on this and allied subjects.

In Part I conditions are discussed which effect bacterial growth and determine the behavior of micro-organisms such as hydrogen ion concentration and pH, oxidation, reduction, colloids and enzymes. One chapter is devoted to the chemical composition of bacteria, yeasts and the lower fungi. Part II deals entirely with metabolism and includes chapters on the nutrition of the autotrophic and heterotrophic bacteria, adaptive and constitutive enzymes, growth factors, bacterial respiration, nitrogen and carbohydrate metabolism, alcoholic and industrial fermentations, fermentation

products of the lower fungi and the proteins, polysaccharides, lipoids and pigments of micro-organisms. Part III takes up a consideration of antigens, haptens, antibodies, complement and the mechanism of antigen-antibody reactions. An appendix deals with the isolation and identification of metabolic products.

Our knowledge of chemotherapy and immunochemistry has increased considerably in the past decade and there seems to be every promise that these two subjects will play an increasingly important role in the future in the treatment of not only diseases of bacterial origin but those due to yeasts and fungi and possibly also those of an endocrine origin and of malignancy as well.

AIDS TO BACTERIOLOGY, by William Partridge, F.I.C., Late Public Analyst for the County of Dorset and the Boroughs of Poole and Penzance. Sixth Edition. Revised by H. W. Scott-Wilson, B.Sc., B.M., B.Ch. (Oxon.), Director of the Laboratories of Pathology and Public Health, London. Pp. 300. Price, $1.50.

AIDS TO BIOCHEMISTRY, by E. A. Cooper, D.Sc. (Lond.), F.I.C., A.R.C.S. (Lond.), and S. D. Nicholas, B.A. (Oxon.), A.I.C., Lecturer in Chemistry, University of Birmingham. Second Edition, 1938. Pp. 213. Price, $1.50.

AIDS TO EMBRYOLOGY, by Richard H. Hunter, M.D., M.Ch., Ph.D., M.R.I.A., Lecturer in Anatomy, Queen's University, Belfast; Sometime Examiner in Anatomy for the Primary Fellowship of the Royal College of Surgeons in Ireland. Author of "Aids to Surgical Anatomy," "A Short History of Anatomy," etc. Third Edition, 1938. Pp. 178. Price, $1.25.

AIDS TO HISTOLOGY, by Alexander Goodall, M.D., F.R.C.P. Edin., Lecturer on Physiology, School of Medicine of the Royal Colleges; Physician-in-Ordinary to the Royal Infirmary, Edinburgh. Fourth Edition, 1938. Pp. 151. Price, $1.25. William Wood & Company, Baltimore, Md.

The Students' Aids Series include 39 volumes on as many different medical or allied subjects, four of which are listed above. These small pocket-size volumes are very well written and the text on each subject has been boiled down to the essential facts. They are designed to assist students in mobilizing the important points by presenting them in a concise and lucid manner and which can, if necessary, be memorized prior to examination. They are of aid to the practitioner who can "brush up" on any of the subjects in a brief space of time. The complete list of the Students' Aids Series will be furnished by the publishers on request. They are all written by English authors who are outstanding in their respective fields. For books of this type, designed to meet a particular need in supplementing more complete texts, this series is highly recommended.

NEWS AND ANNOUNCEMENTS

REGISTRY OF MEDICAL TECHNOLOGISTS
OF THE
AMERICAN SOCIETY OF CLINICAL PATHOLOGISTS

WRITTEN QUESTIONS FOR EXAMINATION, OCTOBER, 1938

IMPORTANT—Select 10 out of 11—DO NOT answer more than 10 questions.

I. 1. What are the normal calcium and phosphorous values of human serum?
2. List the non-protein nitrogen constituents of blood.

II. Define the following:
1. Reticulocytosis.
2. Myeloblasts.
3. Thrombocytopenia.
4. Shift to the left of neutrophils.
5. Achlorhydria.
6. Microcytic hypochromic anemia.
7. Color index.
8. Prothrombin time.
9. Volume index.
10. Leukemia.

III. Give one method of the following:
1. Heterophile antibody test.
2. Sedimentation time.
3. Clot retraction time.
4. Coagulation time.
5. Color Index.

IV. Outline how you would prepare the following:
1. Normal sulphuric acid.
2. Nutrient agar from original constituents.
3. Protein-free blood filtrate.
4. Stock sugar standard solution.
5. A satisfactory anti-coagulant for blood.

V. 1. Show by diagram the blood groups according to the Moss, Jansky and International classifications.
2. Give one method for cross matching of blood.

VI. List the procedures ordinarily included in the following examinations:
1. Gastric analysis.
2. Complete examination of spinal fluid.

VII. Give the technic for the following:
1. Quantitative examination for sugar in urine.
2. Test for occult blood in urine.

VIII. Make a sketch of the following urinary constituents:
1. Pus cells.
2. *Three* types of epithelial cells.
3. Red blood cells.
4. *Two* types of casts.
5. *Two* types of urinary crystals.

IX. Name three tests for kidney function and give the technic for one of them.

X. 1. Make a drawing of *five* types of intestinal parasitic ova.
2. Give *one* method for concentration of ova.

XI. On what type of culture media should the following organisms be grown to obtain the best growth:
1. Diplococcus pneumoniae.
2. Mycobacterium tuberculosis.
3. Brucella melitensis.
4. Salmonella paratyphi A.
5. Staphylococcus aureus.

Due to the agitation for state licensure for Medical Technologists in the several states, attention is called to the announcement of the Registry appearing on the inside back cover of this Journal. All registered Medical Technologists are urged to support the Board of Registry in its endeavors to combat this undesirable movement.

The official exhibit of the Registry was conducted under the direction of Doctor Roy S. Kracke, a member of the Board, during sessions of the Southern Medical Association in Oklahoma City in November.

MARCH 1, 1939, is the DEAD LINE for application to the next semi-annual examination of the Registry of Medical Technologists.

In order to do full justice to each aspirant for a certificate the closing date has been changed from March 15 to March 1, 1939.

Every registered Medical Technologist received a letter and post card from the A. S. M. T. relative to membership in the national society. This was mailed out by the Registry office with your annual renewal notice.

NATIONAL

ADDITIONAL APPOINTMENTS TO COMMITTEES

(Continued from November, 1938, issue)

Program Committee:
Sarah Deupree, Texarkana, Texas

Local Arrangements Committee:
Phyllis Stanley, Newark, N. J.

Sisters Reservations and Entertainment Committee:
Sister Mary Emmanuella Droste, St. Charles, Mo.

Research Committee:
Walter Dell, McAlester, Okla.
Faith Dravis, Ellensburg, Wash.
Sister Mary Gonzaga O'Rourke, Detroit, Mich.
Margaret Wade Brown, Fulton, Mo.

Reception and Registration Committee:
Phyllis Stanley, Newark, N. J.

Nominating Committee:
Sister Mary Jannette Bodoh, Hays, Kansas

Entertainment Committee:
Phyllis Stanley, Newark, N. J.

Committee on Awards:
Doctor Israel Davidsohn, Chicago, Ill.

Scientific Exhibits Committee:
Henrietta Lyle, Chairman, Lancaster, Pa.
David Silcock, Versailles, Ky.
Clara Weltge, St. Louis, Mo.
Mariam Young, Denver, Colorado

Board of Counsellors:
Sister Mary Faustine Masanz, Fon du Lac, Wis.—East Central States
Mae Spoonar, Everett, Wash.—North Western States District

May we call your attention to the hotel reservations blank for the St. Louis session in the back of this issue.

Due to the pressure of enlarged business, and in keeping with their need for greater facilities which will serve their accounts better, the Clay-Adams Company have moved to new and much larger quarters at 44 East 23rd Street, New York City.

Arkansas

The Arkansas Society of Medical Technologists met at the University of Arkansas School of Medicine on September 24, 1938, for a one-day convention. There were 46 registered. The conven-

tion was opened with greetings from the dean, Dr. Frank Vinsonhaler.

Scientific papers were presented by Barbara Belzner, M.T., Camden; Mrs. Violetta Wakefield, M.T., Ft. Smith; Rose McClannahan, M.T., Little Rock; C. E. DeAngelis, M.D., Little Rock; George Cannefax, MT., Hot Springs; M. J. Kilbury, M.D., F.A.S.C.P., Little Rock; J. J. Andujar, M.D., F.A.S.C.P., Fort Worth, Texas; Louise Vance, M.T., Pine Bluff; P. J. Almaden, Ph.D., Little Rock; Helene Taylor, M.T., Little Rock; Lucile Scott, M.T., Little Rock; and Ann Snow, M.T., Little Rock.

Following a visit to the exhibits and a tour through the building, a luncheon was held in the dining-room of the Medical School.

Scientific Exhibits were presented by The Registry, Denver; Violetta Wakefield, Ft. Smith; Frances Yutterman, Ft. Smith; Louise Vance, Pine Bluff; Lucile Scott, Little Rock; and Ann Snow, Little Rock. Commercial exhibits were shown by Difco Laboratories, Detroit, and Bausch & Lomb, Rochester.

A banquet was held in the banquet hall of the Albert Pike Hotel with Dr. J. J. Andujar, of Ft. Worth, Texas, as principal speaker.

The following officers were elected for the ensuing year: Pres., Mrs. V. Wakefield, Ft. Smith; Vice-President, George Cannefax, Hot Springs; Secretary-Treasurer, Lucile Scott, Little Rock; Advisory Board, Margaret Clark, Louise Vance, Ann Snow, Dr. A. A. Blair, Dr. J. M. Kilbury, and Dr. Dee C. Lee.

Little Rock was selected for the 1939 convention.

Minnesota

At this early date only tentative plans are under way for the annual convention of the Minnesota Society of Medical Technologists. It convenes in St. Paul instead of rotating to Duluth as it would have, had the former traditions of the Minnesota Hospital Association of which it is an allied organization been followed. The change was voted into effect because the greater crowds are central to the Twin Cities.

The Arrowhead Society of Medical Technologists, the original nucleus of the State society, is functioning with the following officials at its head:

President—Mr. Charles Haver, Nopeming Sanatorium.
Vice-President—Miss Helen Hoff, Medical Arts Bldg.
President Elect—Miss Bernice Johnson, Miller Memorial Hospital.
Immediate Past President—Miss Sybil McCullough, Medical Arts Bldg.
Secretary—Miss Cecelia Widman, Duluth Clinic.
Treasurer—Miss Florence Duggan, Medical Arts Bldg.
Board Member—Sr. M. Alcuin, St. Mary's Hospital.

Pennsylvania

On Monday evening, November 14, 1938, the annual banquet of the Pennsylvania Society of Medical Technologists took place in the Mirror Room at Whitman's with 75 present.

The speakers of the evening were Dr. Robert C. Kilduff and Col. A. Parker Hitchins. Mr. Alexander G. Keller acted as toastmaster. Other guests present were Dr. E. A. Case, Dr. Stanley P. Reimann, Dr. Frank Konzelman, Dr. Fred Boerner and Dr. Donald C. Smelzer.

New Hampshire

The New Hampshire Medical Technologists held their initial meeting and elected Evelyn N. Jardine, president; Miss Ford, treasurer; Miss H. Boyd, secretary. Professor Frank Connell of Dartmouth Medical College demonstrated the use and value of the concentration and culture method for parasites.

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